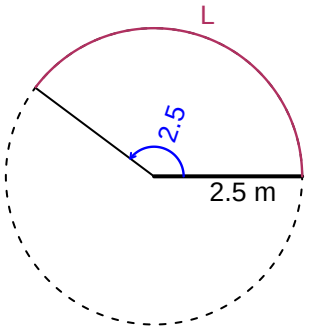
Name: Date:

Trig Final (SLTN v601)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.5 meters. The angle measure is 2.5 radians. How long is the arc in meters?

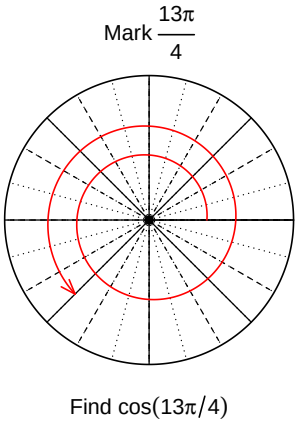


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

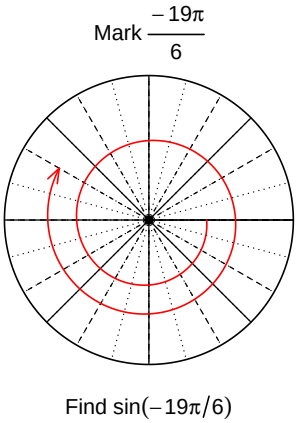
$L = 6.25$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{4}\right)$ and $\sin\left(\frac{-19\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(13\pi/4)$



Find $\sin(-19\pi/6)$

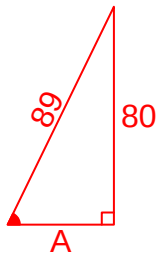
$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-19\pi/6) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{80}{89}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

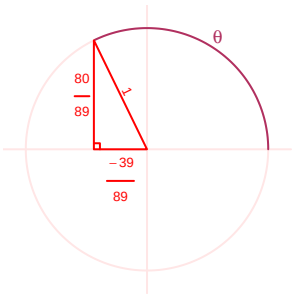
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 80^2 = 89^2$$
$$A = \sqrt{89^2 - 80^2}$$
$$A = 39$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{80}{89}}{\frac{-39}{89}} = \frac{-80}{39}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 7.16 meters, a midline at $y = -8.85$ meters, and a frequency of 3.63 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -7.16\sin(2\pi 3.63t) - 8.85$$

or

$$y = -7.16\sin(7.26\pi t) - 8.85$$

or

$$y = -7.16\sin(22.81t) - 8.85$$